aborigines of strong individuality. The impressive fact, learned alike through observation of a typical tribe and through analysis of the mental operations of primitive peoples in general, is that the savage stands strikingly close to sub-human species in every aspect of mentality as well as in bodily habits and bodily structures.

Since Huxley's prime the chief advances in anthropology have related to what men *do* and what men *think;* and the progress has been such as to indicate with fairly satisfactory clearness the natural history of human thinking as well as that of human doing. Thereby man's place in nature may be defined more trenchantly than was possible in 1871: (1) As shown by Huxley, the structure of *Homo sapiens* is homologous with that of lower orders, while the morphologic differences between highest anthropoids and lowest men are less than those separating lowest men from highest men; (2) As suggested by Huxley and established by later researches, the activities of *Homo sapiens* are homologous with those of the anthropoids, while the activital range between club-using gorilla and tooth-using savage is far narrower than that separating the zoomimic savage from the engine-using inventor; (3) As shown by the latest researches, the mental workings of *Homo sapiens* are homologous with those of lower animals, while the range from the instinct and budding reason of higher animals to the thinking of lowest man would seem far less than that separating the beast-fearing savage from the scientist or statesman. The resemblances and differences in doing and thinking may not yet be measured in definite units, as are cranial capacities and facial angles (though the recent progress in experimental psychology gives promise of quantitative determinations of general sort at no distant day); yet the relations are hardly less clear and tangible than those customarily measured in inches and ounces and degrees.

So, in the light of the latest researches, man must be placed wholly within the domain of nature, yet above all other organisms at heights varying widely with that highest product and expression of nature, mental power.

W J McGEE.

THOMAS BENTON BROOKS.

THOMAS BENTON BROOKS was born June 15, 1836, at Monroe, N. Y. He died November 22, 1900, at his home near Newburg, only a few miles from his birthplace, but during the sixty-four years of his life he had gone far, not only to distant countries but also to fields of experience and thought remote from his early environment. Born to the associations and inheritance of a small farm in a country district, he made his way to a prominent position in engineering and geology by his energy, ability and originality.

His early training and also his later education embodied more practise than theory. The district school, two years (1856–58) at the School of Engineering, Union College and a single course of lectures on geology under Lesley at the University of Pennsylvania (1858–59) cover his formal education, but he seized with eager purpose opportunities to learn in the school of practise. By observation of field methods he fitted himself to pass from axeman to rodman, levelman, transit man and topographer, first on surveys for the Erie Railroad and later on the newly initiated topographical and geological surveys of New Jersey in 1853. In this latter connection he served as axeman to an Austrian who employed a then little-known instrument, a plane table, and Brooks by watching him became so proficient in its use that he succeeded his chief. He was then seventeen. Subsequently, while a student at Union College, he made

extensive surveys in the forested mountainous region west of the Hudson, the Highlands. To this experience he added that of service during one winter with a Coast Survey party in the Gulf of Mexico.

The outbreak of the Civil War found him, at the age of twenty-five, established as a trusted leader among his associates. Enlisting as a private, he was followed by a number of those who had known him as a surveyor, and he was mustered into service as 1st Lieutenant, Company A, New York Volunteer Engineers, September, 1861. He served until the fall of 1864, when he resigned at the request of his parents after the death of his brother, Lieut. J. H. Brooks, in the trenches before Petersburg.

Major Brooks, as he was generally called, although he reached the rank of Brevet Colonel, won conspicuous recognition as a military engineer at the sieges of Fort Pulaski and Fort Wagner. His industry was indefatigable, his engineering talent manifest, his courage, devotion and self-sacrifice unfailing.

After a year with the New Jersey Geological Survey, in August, 1865, Major Brooks accepted a position as vice-president and general manager of the Iron Cliff Mine near Negaunee, in the Marquette iron district, Lake Superior. Therewith his more important work in geologic research may be said to have begun. The geology of the Lake Superior Basin had previously been scanned by Foster, Whitney, Houghton, Logan, Agassiz and others, and the Laurentian, Huronian and Silurian systems had been vaguely distinguished; but the pressing problems of the geology of the iron ores and related formations remained untouched. The difficulties of investigation in that district are even now very great. Forest, windfall and underbrush make the physical labor of exploration severe; drift mantles wide areas, and the relations of the folded, refolded, squeezed and metamorphosed formations are extraordinarily intricate. Settlement of the wilderness, extensive prospecting and mining operations and the development of modern petrographical methods have made a solution of these relations possible, but when Brooks faced them the difficulties were unequaled, the means and methods sadly inadequate. Nevertheless, he attacked them with characteristic energy and originality. He invented methods, he provided means, he spent himself, and he achieved the greatest measure of success then possible. In general geology he contributed important data and conclusions on the great geologic systems and the unconformities which separate them. In theoretical geology he first suggested that secondary deposition might be the genetic condition of the iron ore bodies. But it was in applied geology that he made his chief contribution, one in which he found most satisfaction, and one for which not only Michigan is his debtor, but also the people of the United States. Our country's iron and steel industry, our machine shops, our railway systems, and all the wonderful material conquest of the continent have been greatly promoted by exploitation of Lake Superior iron ores. Brooks took hold of that exploitation in its beginning, and he had a leading part in its development. Simple methods were needed of surveying in the unbroken forest amid widely varying magnetic attractions. Brooks devised the dial compass and taught men to pace distances in the most tangled underbrush. Magnetic surveys were necessary as a means of prospecting. Brooks adapted the dip needle to the capacity and purposes of the prospector. Men wanted practical advice based on scientific principles. Brooks harnessed his practise and his science together, and thus became the most reliable mining engineer, as well as the most useful geologist, in the region.

As the chief authority on the iron-bearing formations of the Upper Peninsula, Brooks was asked in 1869 to take charge of the Economic State Geological Survey of that district, and he accepted on condition that he should be allowed to secure all the private aid possible. The necessity for this provision is apparent when it is understood that during four years the State paid toward the work but \$9,000, while he spent \$2,000 of his own means and received no pay himself. The results of his work are embodied in Volumes II. and III. of the Michigan State Geological Survey. His reports are direct in style, simple in treatment and extremely practical in substance. They are models of excellence as economic geologic reports. The most original chapters, and those which still possess most practical value, relate to the principles of mine management and of magnetic observations in prospecting for iron ores. For many years the chapters on geology were standards of reference, and they have been replaced only by most elaborate studies, based largely on Brooks' work and carried out with the most refined methods of modern geology. Says Van Hise, Brooks' successor: "Notwithstanding the immense advantage which it has been to have Brooks' work as a foundation, it has taken many years of labor fairly to complete the structural story to which Brooks contributed important chapters. Only those who have labored in the Lake Superior region and who understand its peculiar difficulties can give Brooks credit for the remarkable work he did. His geological work is my ideal of what should be done in a new region of complex geology."

In 1873 Major Brooks' health gave out under the stress of overwork to which he drove himself. He sought relief abroad, and resided in London and Dresden while completing his State reports. He became a Fellow of the Geological Society of London and Corresponding member of the Geological Society of Edinburgh. Returned to this country in 1876, he resided at Monroe and at Newburg, N. Y., and after 1883, during the winters, at Bainbridge, Ga., living the life of a country gentleman and farmer. His interest in science and engineering practice never abated, and he was always ready with wise counsel, even though strength failed him for action.

Major Brooks was characterized by intense energy, which exhausted his physique before he reached middle age; by originality, which combined with common sense made him a most efficient man of affairs; by keen powers of observation and deduction, which he applied untiringly to scientific research; by geniality and affection, generosity, truthfulness and loyalty to principle, which made him beloved and stamped him as a man whose memory will be honored and revered.

BAILEY WILLIS.

U. S. GEOLOGICAL SURVEY.

SCIENTIFIC BOOKS.

THE APPRECIATION OF NON-EUCLIDEAN GEOMETRY.

Histoire des Mathématiques. Par JACQUES BOYER. Paris, Carré et Naud. 1900. 8vo. Pp. xi + 260. Price, 5 francs.

Geometry: Ancient and Modern. By Professor EDWIN S. CRAWLEY. *Popular Science Monthly* (January). 1901. Pp. 257–266.

Non-Euclidean Geometry. By Professor HENRY PARKER MANNING. Boston, Ginn and Company. 1901. 8vo. Pp. vi + 95.

The last section of Boyer's attractive book is headed 'Géométrie Euclidienne et Géométries non-Euclidiennes.' He says, p. 240, "The last quarter of the nineteenth century witnessed the building up of interesting theories." The next page continues: "But beyond contradiction the most original researches of this period pertain to the non-Euclidean geometries, and it is by them that we will terminate this incomplete exposition of contemporary science." The brief account which follows (less than five